

The Wounds of President John F. Kennedy

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"What we have seen about the necessary sideways angle of bullet travel makes the single bullet theory untenable. The assassination could not have happened the way the Warren Commission says it did."

Bullets struck President Kennedy at two places on his body, the neck-shoulder area and the head. While it was the head wounds that killed the President, the evidence relating to the neck-shoulder injury inflicted by the first shot may tell us more about the assassination.

Neck Wound Altered

There is no question but that the wound in the back, which we will call the shoulder wound, is an entrance wound. The fibers of the President's clothing were turned inward at the site of the wound and all of the doctors who saw the wound, either directly or in photos, have concluded that it was one of entrance. There has been more confusion about the wound to the neck in front, and some Warren Report critics have emphasized that it was described by doctors at Parkland Hospital in Dallas as having characteristics of an entrance wound. In their efforts to save the President's life they undoubtedly did not take time to study it closely and also made an incision at the site to insert a tracheotomy tube to assist the President's breathing. This so altered the wound site that the autopsy doctors at Bethesda Naval Medical Center did not even recognize that there had been a wound there.

The theory that the neck wound was one of entrance cannot be viable without accounting for the bullet. We would have to believe that a bullet traveling at a high velocity could strike soft tissue in the front of the neck, come to a full stop within a distance of no more than two inches without damaging the neck vertebrae immediately behind the wound, and then disappear. Furthermore, we must take into account the lateral direction of the bullet path. A shot fired from the grassy knoll would have been traveling at a lateral or sideways angle of about 35 degrees. Striking the President at the midline of the neck it would necessarily have continued into the left side of the body. There is simply no evidence that there was any damage to the left side of the President's body whether in neck, shoulder, or back.

Small bullet fragments are visible, however, on the X-rays in the area between the shoulder and neck wounds on the right side. The only conclusion that seems reasonable is that the bullet entered the shoulder on the right side and passed through the body exiting at the midline of the neck. This interpretation, which was that of the Warren Commission, has not been questioned by any of the doctors who subsequently reviewed the autopsy materials. To rule out a first shot from the grassy knoll, however, does not eliminate the possibility that shots were fired from that site which struck the President in the head.

Evidence on First Shot Overlooked or Misinterpreted

Accepting the general idea that the first shot bullet passed through the President's body from back to front does not necessarily mean accepting all the Commission's other conclusions about that shot. To me the evidence on the first shot tells a great deal, much of which was overlooked or misinterpreted by the Commission.

Both the X-rays and the observations made during the autopsy showed that the bullet did not damage any bones in the President's body. Thus any bullet traveling through his body had to travel in a path which was outside the bony structure of the body or in between the bones. This means that study of the human skeleton can give us valuable information about the first shot in the assassination. The one used and shown in the accompanying pictures is a standard articulated male laboratory skeleton. While there are, of course, differences between people in skeletal sizes and proportions the matters with which we will be concerned are basic characteristics of the human skeleton and beyond the range of normal variations between individuals.

We know quite precisely where the wound was located in front. Bullet holes in the shirt in the two overlapping portions just below the collar button, a nick in the knot of the President's necktie, and the fact that the wound was at the site of a tracheotomy incision all locate the wound in the midline of the body just below the Adam's apple.

30 Degrees Sideways to the Left

Just behind this point, though, are the neck vertebrae. Regardless of the size of its downward angle, a bullet not striking the neck vertebrae and passing through this point would need to be traveling at an angle of close to 30 degrees sideways to the left. This is shown in Figure 1. Observe this figure closely and consider its implications. They are profound.

The matter of lateral or sideways angle is a crucial factor which was completely ignored in the Warren Report. Sideways angle alone would rule out the possibility of the bullet striking Governor Connally. If the bullet would have struck anyone, it would have been either Mrs. Connally or William Greer, the driver.

There is only one way in which a bullet traveling at such an angle sideways through the President's body could have struck Governor Connally and that is if the President were himself turned at an angle near 30 degrees. The Zapruder film and other pictures



Figure 1. View from above of laboratory skeleton with skull removed. Dark rod indicates minimum angle of bullet laterally. Rod passes through midline of neck in front and just touches the sides of the neck vertebrae. Any bullet not striking bone could hardly travel at much less of a lateral angle.

show clearly that this was not the case as his body was facing squarely ahead in the car. His head was turned to the right at about the time the first shot was fired but this would not affect his chest or shoulders. The reader can check this for himself by placing a finger on the hollow of his throat between the Adam's apple and breastbone and turning his head. The lower part of the neck moves hardly at all.

Single Bullet Theory Untenable

What we have seen about the necessary sideways angle of bullet travel makes the single bullet theory untenable. The assassination could not have happened the way the Warren Commission says it did.

The first bullet passed through the President's body in a sideways direction. If the bullet exited toward the left of the President and was going at a downward angle, how could it have avoided landing in the car? This raises the question, just what was the downward angle of the bullet?

The downward angle of approximately 18 degrees determined by the Commission was established by surveying techniques based on both the position of the car at the time the shot was assumed to have been fired and the position of the sixth floor window of the Depository building. This angle then is predicated on the assumption that the shot came from what is thought to be Oswald's position. But where the shots came from is what the Commission was trying to establish — the position should have been a conclusion. The Commission used circular reasoning.

There is another approach to determining the downward angle of the shot, and that is to study the path of the bullet through the President's body and the relationship of the body to its immediate environment, the presidential limousine.

Before attempting this though, let us look at the skeletal structure of the shoulder, which is a very complicated part of the body, a veritable jumble of bones. Not only are there many bones in the area, but they are related to each other in complex ways. The back vertebrae and the ribs form a relatively solid unit, the ribcage. The neck vertebrae are somewhat more free to move, and the head pivots forward or backward on the uppermost vertebrae.

The bones of the shoulder — the clavicle and the scapula — are only loosely attached to the ribcage. It is this flexible attachment which permits us to move our shoulders up and down and to the front and back. Most of the muscles of the upper back are attached to the scapula and control it. Thus, movements of the scapula are associated with (indeed, are caused by) movements of the muscles in back. Also, as the muscles move, so will the skin covering them.

We have already seen that the scapula and flesh of the upper back move about quite freely outside the ribcage. We cannot automatically assume that the position of the flesh at the time of the autopsy measurement was the same at the time the wound was received. As a matter of fact, there is good reason to believe that it was not.

Measuring the Location of the Bullet Hole

The location of the bullet hole was determined by measuring down from the mastoid process. The latter is a bony knob on the lower part of the skull just behind the ear. The autopsy measurements located the wound as being 14 centimeters (5-1/2 inches) down from the mastoid process. Measuring from a point on the skull can introduce error because of flexibility of the neck and variation in the position of the head.

Thus, the autopsy measurements locating the wound in back were made between two movable points, the mastoid process and the wound itself. In observations on a number of subjects, I have found that the distance between the mastoid process and a spot on the shoulder corresponding to the wound site varied from one and one-half to two inches according to the relative positions of head and shoulders. That is, a distance of 5-1/2 inches between these two points with the head drawn back and the shoulders raised becomes 7-1/2 inches when the head is forward and the shoulders are lowered to their normal position.

"The Changed Relationship of Muscles At the Time of Autopsy"

There are no such problems in determining the location of the wound in front. If we could establish the point of entrance of the wound in back it would be a simple matter to determine the downward angle of the bullet. But because of the problems mentioned above, there is no guarantee that the positions of the head and shoulders at the time of the autopsy were the same as at the time the wound was inflicted so that the actual point of entrance of the bullet could have been different from the apparent point of entrance observed during the autopsy and shown in the autopsy photos. The possibility was recognized by four physicians (the 1968 Doctor's Panel) who reviewed the autopsy photos and X-rays at the request of Attorney General Ramsey Clark. The Panel referred to "the changed relationship of muscles at the time of autopsy," but did not consider it further.

The consideration might help us to explain a conflict between the autopsy report and the FBI Summary Report of 9 December 1963 and Supplementary Report of 13 January 1964. The information about the autopsy in the FBI report is based on the observations of two FBI agents who were present during the autopsy. The agents reported that the missile path extended downward at an angle of 45 to 60 degrees and was less than a finger length in depth.

It has never been explained before how a bullet traveling at a downward angle of approximately 18

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Figure 2. Shows how changed position of muscles could alter apparent point of entrance of bullet. At time of shot, shoulders are lower and bullet enters in a straight line at point "B". If shoulders are raised during autopsy, muscle tissue is moved making it appear that the bullet entered at point "A". Such a displacement could lead to the impression that the bullet path was from 45 degrees to 60 degrees downward. A rib or the bend in the muscle tissue itself could suggest that the wound was a shallow one.

degrees could make a wound at an angle of 45 to 60 degrees, and also why a bullet which traveled through the President's body would not have left a path that could have been probed all the way. What we conclude here is that the angle observed at autopsy was determined not by the actual angle of travel of the bullet, but rather by the change in the position of the President's shoulders. This would also produce a bend in the bullet path which would make the wound appear to be a shallow one. It is possible that had the doctors arranged the President's shoulders in their natural position they could have run a probe through the body following the bullet path. (See Figure 2.)

A Fold of Flesh at the Back of the Neck

The possibility of determining the downward angle of the bullet was recognized by the 1968 Doctor's Panel. They stated that the wound in back "lies approximately 5.5 cm. below a transverse fold in the skin of the neck which shows an anterior tracheotomy wound. This view makes it possible to compare the levels of those two wounds in relation to the horizontal plane of the body." The Panel, however, did not report actually attempting to determine the angle.

Since then, other doctors have been given permission to review the autopsy material. Dr. John K. Lattimer, in an article published in the May, 1972 Resident and Staff Physician simply stated that the angle was "a bit steeper" than the ten degree downward angle shown in the Warren Commission exhibit (#385). Dr. Cyril Wecht reported the angle to be 11-1/2 degrees in the Forensic Science Gazette, September, 1973. This seems to be an essential agreement with Lattimer, but is about six degrees less than the downward angle from the sixth floor Depository window. This discrepancy cannot be ignored. Either someone was firing from a lower position or the President's body was not in the same position at time of autopsy as when struck. Both are probably true.

Those who have seen the autopsy photos have referred to a fold of flesh at the back of the neck, as has already been mentioned. Lattimer wrote: "This fold in the skin of the neck was very prominent," and he went on to speculate that the tissues in this area were thickened "due to the cortisone derivative he is said to have taken." I have observed closely photos and movies of the President and have not noticed any evidence of appreciable thickness or folds of tissue at the back of the neck while the President was alive and will suggest an alternative explanation for this fold.



Figures 3 and 4. These photos of a subject show how differences in head and shoulder positions can influence measurements between the mastoid process (marked behind the ear) and a spot on the shoulder in the back. In the normal erect position, the spot is 7 1/2 inches from the mastoid process. With the shoulders forward and the head back in lying prone, the measurement between the same two points is only 5 1/2 inches. Note the folds of skin at the neck in Figure 4 which are similar to that observable in the autopsy photos and indicates that the President's head and shoulders were closer together during the autopsy than normal, which shows that the actual wound site was lower on the body than the autopsy measurements indicate.



I have observed subjects in the course of making measurements from mastoid process to shoulder wound site as mentioned earlier, a similar fold of skin is evident when the head is drawn back and the shoulders are raised as when lying in the prone position. (See example in Figures 3 and 4.) I suggest that the fold of skin observable in autopsy photos is evidence that the head and shoulders were closer together than they were at the time the wound was received. This would mean that the actual point of bullet entrance was lower than indicated by the autopsy photos and consequently that the downward angle of the bullet was less than the 11 to 12 degree angle determined from them.

Bullet Not Found in Car

There are important implications arising from the extent of the downward angle of the bullet. Keeping in mind that the sideways angle of the bullet rules out the possibility of it striking Governor Connally, if it were traveling at a relatively small downward angle it could have escaped over the side of the car.

At the time of the assassination, the window next to driver William Greer was completely lowered. As the President's neck was somewhat higher than the side of the car, a bullet could be traveling three degrees downward with respect to the car and still miss it. Also, as the road inclined downward at about three degrees, these two factors taken together mean that a bullet traveling at a downward angle of six degrees could strike the President where it did and still escape the car out the side window, burying itself in the grass in Dealey Plaza. If the shoulder at the time the wound was received was only a half inch lower than at time of autopsy the wound positions would be consistent with a trajectory flat enough to have enabled the bullet to miss the limousine. The fold of skin at the neck during autopsy indicated that the shoulders were abnormally high, which would exaggerate the downward bullet angle rather than vice versa.

While a near-horizontal direction of the bullet is indicated by the autopsy material, it is confirmed by the fact that the bullet was not found in the car. The absence of the bullet in the car is what suggested the single-bullet theory in the first place, because it was concluded that if the bullet were fired from above and did not land in the car, the only place it could go was into Governor Connally. But we have seen that the sideways angle of the bullet rules out its striking the Governor.

Limousine as an Indicator of Bullet Path

We should raise another issue here, that of the extent of lateral travel of the bullet. The data clearly point to a sideways path of bullet travel, the only question is how great was the angle. It was stated earlier that with a laboratory skeleton an angle of near 30 degrees was needed to clear the neck vertebrae. By a simple process of calculation using observed sites of the shoulder and neck wounds on the President, one can attempt to determine the trajectory laterally. Wecht states that the length of the sound path is 15cm. (almost 6 inches). He places the shoulder wound as 4.5 cm. from the midline, but both Lattimer and the 1968 Doctor's Panel give the distance as 5 cm. (about 2 inches) from the midline of the body. These measurements thus point to a lateral angle near 20 degrees.

Although even this angle would be too great for the bullet to strike Governor Connally, it would not

be sufficient to permit the bullet to pass from the car; instead either the driver or the windshield would have been struck. I maintain, though, that it is just as valid to use the limousine as an indicator of bullet path as it is to use the body of the President. The same problems of initial body position and of shoulder mobility and possible displacement at autopsy arise in trying to determine lateral angle as were encountered in establishing downward angle. Even a half inch difference in shoulder position laterally would give an angle closer to 30 degrees than to 20 degrees. The vehicle is a better-known quantity, and if its configuration requires a lateral angle of near 30 degrees for the bullet to pass from it then the most likely conclusion is that the bullet was traveling at this angle. The lateral angle from the sixth floor window Oswald was assumed to have used to the car at the time of the first shot is only about 15 degrees.

Connally's Testimony

The evidence we have looked at here supports the testimony given before the Commission and the subsequent statements of one of the principals in the case — Governor Connally. The Governor has said that he heard the first shot, had time for it to register on his consciousness, turned to the right to look at the President, could not see him from that direction so started to turn to the left, and was hit only after he was in the process of turning to the left. Mrs. Connally's recollection is similar — that she had time to turn around and observe the effect of the shot on the President's facial expression before her husband was struck. The Commission chose to disregard the Governor's view that the President had been hit by a different and earlier bullet than the one which struck the Governor in the shoulder.

We may note in passing that the path of the bullet which struck Governor Connally as determined from the location of his wounds is quite consistent with a shooting position on the sixth floor of the Depository building. The path was in a downward and right-to-left sideways direction. The bullet entered by the Governor's right armpit and finally stopped in his left thigh. A bullet fired from the same position would have followed a similar path if it struck the President. It would have traveled downward and to the left. It could no more have struck the Governor in the right shoulder than could the bullet which actually struck the Governor have gone ahead to hit the right shoulder of Secret Service agent Roy Kellerman in the front seat of the car.

Distorted Distances and Perspectives

Consideration of sideways angle leads me to question whether the President and Governor Connally ever were both in line with the Depository window in a way assumed by the Commission and required by the locations of their wounds. The idea that they were so in line is based on casual observation and pictures made with telephoto lenses — which distort distances and perspectives.

Let us look first at their relationship to each other in the car. (See Figure 5.) Governor Connally was seated more toward the center of the car than was the President, but the bullet supposedly traveled from the center of the President's body to the right shoulder-armpit area of the Governor. This would offset their differences in position and result in a line of bullet travel parallel with that of the car.

smaller the bullet and the lower its velocity, the more its exit wound would tend to resemble a wound of entrance.

To say that a person was shooting from near street level raises the questions of his location, the location of the car at the time, and the time of the first shot. These questions are all inter-related.

While the evidence will allow us to establish the bullet path as being in a near-horizontal direction it cannot determine the exact angle of travel because the data are not that precise. A five or six degree downward angle is thus just as much in accord with out evidence as an angle of zero degrees. This would allow a position of origin of the shot to be up to twelve feet off the ground for every one hundred feet of distance away, even more if we take into account the incline of Elm Street itself.

The Commission concluded that the President was struck at about Zapruder frame 210. This would place the car at approximately the beginning of the fourth road stripe on Elm Street. If we project backwards from this point with the angle range of approximately 30 degrees, we see that possible locations for a rifleman are a window on a lower floor on the west end of the Depository, a car or truck parked in front of the Depository toward its western end, or a position where one could be partially hidden by the trees across the street from the Depository. Regardless of the specific location, the general area is near the western end of the main Depository building.

A Bullet Mark on a Sidewalk

In view of the location determined by the approach used here it is interesting to consider File 1546, a report of FBI Agent Robert P. Gemberling. On pages 66-68 of this report, Gemberling refers to a bullet mark on a sidewalk in Dealey Plaza reported to him by a Dallas resident. This citizen said that the mark had been shown on television shortly after the assassination and he was surprised that no mention had been made of it in the Commission Report which had then just been released. Two FBI agents investigated the next day.

Gemberling's report said they found that, "In the area of the second lamppost, approximately thirty-three feet east of the post, in the sixth large cement square, four feet from the street curb and six feet from the parkside curbing, is an approximately four inches long by one-half inch wide dug-out scar, which could possibly have been made by some blunt-ended type instrument or projectile. . . . This particular scar is in line with the western end of the multifloor section of the Texas School Book Depository Building." The report also states that the line of the scar is such it could not have come from the sixth floor window the Commission said Oswald fired from.

This scar is in line with the position we have determined here as the location of the first shot. I suggest that the scar was made by a second shot from this position which missed and struck the sidewalk instead.

Conclusion

We have seen how the fact that the neck vertebrae were immediately behind the front wound precludes the

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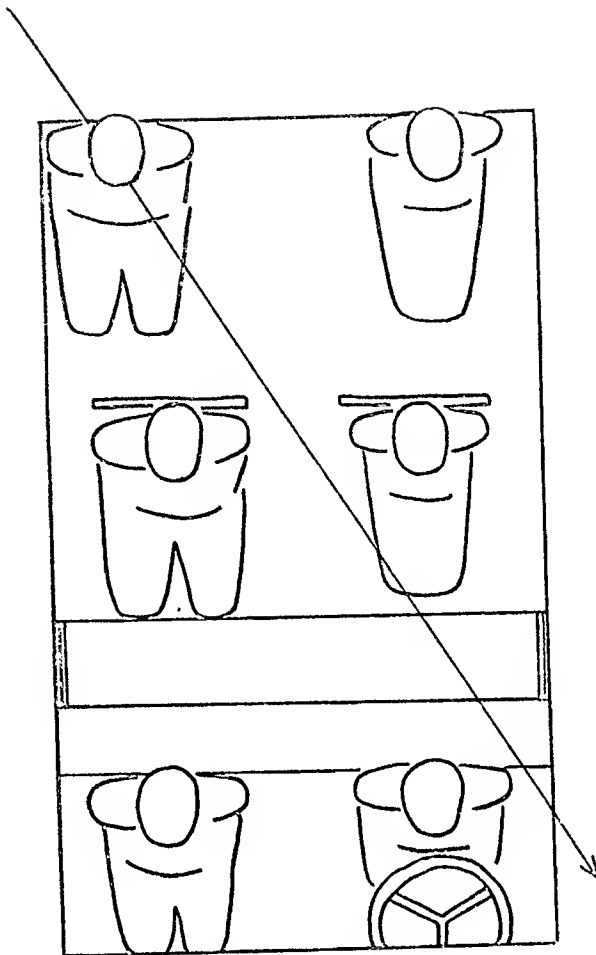


Figure 5. Scale schematic diagram of presidential limousine. Bullet traveling at approximately 30 degrees laterally and in a near-horizontal direction would not strike Governor Connally, but pass to his left and could escape the car out the open window beside the driver.

The sideways angle of the car relative to the depository is clearly evident in Commission Exhibit 893, showing the reenactment of Zapruder frame 210. In this exhibit, although the person representing the Governor appears to be in line with the vertical crosshair, it is the center of his body and not the right side.

Exhibit 893 also permits some observations about downward angle. One can see that the horizontal crosshair is in line with the small of the back of the person representing Governor Connally, and with the back of the jumpseat. A bullet entering in the area of the President's shoulder and traveling at a downward angle of 18 degrees would, of course, strike lower on the body of the Governor than the shoulder- armpit area. It seems likely that the Connally bullet was fired from the Depository sixth floor and that in striking one of the Governor's ribs it was deflected somewhat increasing the downward angle by no more than 10 degrees.

Interrelated Questions

We may make another observation regarding the entrance-like characteristics of the President's neck wound. If the bullet involved were from a gun other than a Mannlicher Carcano, we can not make any assumptions about the bullet type or velocity. The



Figures 2 and 3. "Christopher Johns with a gun" These photographs were taken at approximately the same time, but at different angles from the sun. In each photograph, the shadow of the body, the shadow of the nose and the shadow of the eyebrows are completely consistent with one another. Compare these photos with Figure 1 to see the inconsistencies of the shadows in that picture.

Forman — Continued from page 6

possibility that the bullet passed through the President's body in the way asserted by the Warren Commission. Rather, it would have been traveling at a lateral angle too great to permit it to strike Governor Connally. The mobility of the shoulder area and indications from folds in the skin that the shoulders at time of autopsy were not in their normal position mean that attempts to determine the

bullet's direction from autopsy data can only be approximate. The configuration of the limousine also needs to be taken into account, and when combined with autopsy evidence, support the conclusion that the first shot was fired from a location lower than the sixth floor of the Texas School Book Depository and from a position in or near its western end. □